

ITS STRATEGIC PLANNING

TERMS OF REFERENCE

1. INTRODUCTION

As a result of economic development, urbanization, and in particular, the growing trend for “just-in-time” delivery of goods within the manufacturing industries, there has been a phenomenal increase in transportation demand leading to significant traffic congestion problems on Canada’s transportation system. The advent of the North American Free Trade Agreement (NAFTA) is aggravating the situation from inter-city and inter-provincial corridors to international border crossings as well. Traffic congestion inevitably contributes to air / noise pollution; reduction in business productivity and competitiveness; the need for infrastructure expansion and substantial public investment; and, the degradation of personal health and well being. With the realization that significant expansion of the existing infrastructure would be socially unacceptable and unsustainable, Intelligent Transportation Systems have proven to be an innovative means of alleviating, or at least lessening, the problems for both passenger and goods transport.

The Intelligent Transportation Systems (ITS) Plan for Canada: En Route to Intelligent Mobility, announced by Transport Canada in November 1999, is a key element of the federal government’s framework to bring Canada’s transportation system into the 21st century. The framework encourages the best use of all modes of transportation and builds on partnerships with all jurisdictions and with all players in the transportation sector. It aims to make Canada’s transportation safe, efficient, affordable, integrated and environmentally friendly. The framework has four objectives:

- To promote transportation safety;
- To support trade and tourism through more productive and “smarter” transportation systems;
- To improve our quality of life by promoting more sustainable transportation systems; and
- To sustain strategic investment for transportation.

Canada’s ITS Plan sets out the federal government’s strategy to stimulate the development and deployment of ITS in Canada to maximize the use and efficiency of existing infrastructure and meet future mobility needs more responsibly. The Plan calls for the development of a national ITS architecture to guide the deployment of ITS applications in order that products and services can be seamlessly integrated while achieving national, North American and international compatibility. The development of the Canadian Architecture for ITS is in progress. The current master list of 35 ITS user services and 90 sub-services under 8 development areas for Canada, and the interconnection of the subsystems of the Canadian ITS Architecture are attached as Appendix B and Appendix C respectively for reference.

The Plan also proposes to support strategic deployment and integration of intelligent transportation systems across urban and rural areas and on inter-city and international corridors by leveraging complementary public and private sector investments.

2. PURPOSE AND OBJECTIVES

The primary purpose of ITS strategic planning is to develop a comprehensive “roadmap” setting the direction and pace of ITS investments within the Province / Territory / Region over the next 10 years and beyond in a coordinated and focussed manner. A plan that addresses the growing transportation needs of the Province / Territory / Region through the provision of a balanced and multi-modal transportation network. Within this plan, a list of viable, cost-effective projects will be identified that fit within its deployment program and will assist in meeting its short, medium and long term goals. To be truly effective, the ITS Strategic Plan will need to be consistent with the direction and objectives of Canada’s ITS Plan and to conform with the national ITS architecture.

The objective of the ITS Strategic Plan is to develop, program and communicate strategies for the development and deployment of a broad-based ITS program within the Province / Territory / Region that:

- Supports, enables and enhances a seamless, multi-modal transportation network;
- Helps ensure the competitive position of the Province / Territory / Region in national and international markets while addressing social and environmental objectives; and
- Is supported by major stakeholders.

An important aspect of the strategic plan is the inclusion of a project selection and prioritization process, and the identification of the projected benefits and costs of the ITS program to the Province / Territory / Region and the multi-modal transportation users. As investment in ITS technologies must compete with other demands on the public purse, proper documentation of the amount of investment required and the potential benefit will be essential to ensure successful implementation of the deployment plan. The planning process must also create a framework that allows partnerships to form around strategic ITS initiatives to help implement the plan.

3. GEOGRAPHIC BOUNDARIES

[INSERT GEOGRAPHIC AND / OR JURISDICTIONAL BOUNDARIES TO BE INCLUDED WITHIN THE SCOPE OF THE ITS STRATEGIC PLAN]

4. SCOPE OF SERVICES

The development of the strategic plan for the deployment of ITS technologies which enables a seamless multi-modal transportation network will require a well balanced approach based on consensus building. The Consultant shall recognize the needs of all participants, identify specific benefits, and generate a long term strategy that lends itself to a staged implementation program.

The Consultant will be responsible to complete the work as outlined on the 5-step planning process illustrated in Appendix A for the development of the strategic plan. The process is based on the systems engineering approach to ITS planning with emphasis on user-needs and a strong coalition. The Consultant is also encouraged to recommend changes to these tasks should they feel these modifications will enhance the planning process. The Consultant shall focus on addressing local user needs rather than simply looking for opportunities to utilize new technologies. The scope of services that is more fully described in the following sections will be guided by a Steering Committee comprising multi-agency representatives and technical experts from both the public and private sectors. Despite the linear set of tasks required by the planning process, the Consultant must allow for continual refinement as new events occur.

The Consultant shall note that it is a requirement of the project to be compliant with the most recent version of the Canadian Architecture for ITS.

4.1 Step 1 - Coalition Building

4.1.1 Task 1.1 - Establish List of Stakeholders

For strategic planning on a regional basis, all stakeholders, including the transportation agencies, decision makers, large employers as well as the public must buy-in to the ITS process, and work together as a coalition. They must be afforded the opportunity to provide input into the planning and system design process. The various stakeholders will possess their own agendas, priorities and policies. The pivotal point of the planning will be measured by the success and cooperative manner in which the coalition can work together, share ideas openly and reach compromises.

At the onset of the planning process, the Consultant shall identify all stakeholders within the Province / Territory / Region having direct interests in the ITS Strategic Plan and compile an initial list comprising, but not limited to, the following potential stakeholders:

- **Public Agencies:**
 - Representatives from multiple levels of government and that of neighbouring provinces and states (e.g., federal, provincial, municipal, policy, planning, financing, construction, education, health, science and technology, economic development, tourism, operation, regulation, enforcement, licensing, etc.);
 - Representatives from all modes of transportation agencies (e.g., airports, ports, other terminals, etc.);

- Commercial:
 - Public and private transportation service providers (e.g., municipal transit, taxi, courier, trucking, etc.);
 - Product and service support companies (e.g., automobile associations, telecommunications and cellular, Internet, retailers, etc.);
 - Product and service development companies (e.g., consultants, turnkey suppliers, systems integrators, etc.);

- Industrial:
 - Original equipment manufacturers (e.g., automobiles, hardware, software, communications, etc.);
 - Distributors and suppliers (e.g., wholesalers, retailers, etc.);

- Institutional:
 - Academia and research communities (e.g., universities, colleges, private research firms, etc.);
 - Professional associations (e.g., TAC, ITE, Canadian Council of Professional Engineers, [INSERT PROVINCIAL ENGINEERING ASSOCIATION], etc.);

- Special Interest:
 - ITS Canada;
 - ITS America;
 - Public-private partners;
 - Lobby groups;
 - Media and press stakeholders.

4.1.2 Task 1.2 - Define Outreach Program

With the identification of the base coalition, the Consultant will outline and implement an outreach program to encourage active and hands-on participation of the stakeholders as well as provide educational information and opportunities for input and consensus building throughout the planning process. The outreach program can take the format of contact through letters, telephone interviews, Internet web site / e-mail, seminars and workshops.

As the planning process proceeds, the Consultant shall refine the list of participating stakeholders and expand the list beyond the base coalition to pull in other interested parties as required. The ongoing coalition building will play a significant role in integrating ITS planning with other regional transportation planning efforts and to enable participants to gain ownership of the Strategic Plan.

4.1.3 Step 1 Deliverable - Coalition Building Plan

The Consultant shall submit the Coalition Building Plan which shall include the list of stakeholders and the outreach program to be implemented by the Consultant throughout the planning process for coalition building. The Consultant shall revisit the Plan as the planning process progresses to reflect the identified needs.

4.2 Step 2 - Environmental Scan

4.2.1 Task 2.1 - Needs Assessment

The purpose of this task is to develop an understanding of the current state of the regional transportation system from a multi-modal perspective, including current issues, concerns and problem areas as well as projects, proposals, strategic plans and inter-governmental agreements pertinent to transportation within the Province / Territory / Region. The Consultant shall utilize the Coalition Building Plan developed under Step 1 to solicit the necessary information and shall focus on identifying:

- Current transportation issues, concerns and problem areas, and quantification of the extent and severity of the problems;
- Future transportation issues, concerns and problem areas, and identification of the extent, anticipated timing and severity of the problems;
- Current policies and initiatives or strategic plans regarding transportation within the Province / Territory / Region and their respective funding mechanism;
- Existing and planned transportation infrastructure;
- Existing legacy systems and planned ITS applications;
- Existing and developing organizational structures and institutional arrangements relative to the planning, operation and maintenance of the transportation system, including roles and mandates of the respective agencies; and
- Regional characteristics of infrastructure and travel needs and any differences or commonalities with national characteristics.

[DETAILS OF OPERATIONAL / SAFETY ISSUES, EXISTING STRATEGIC PLANS, LEGACY SYSTEMS, ORGANIZATIONAL STRUCTURE, ETC. TO BE INSERTED BY LOCAL AGENCY]

Based on this information, the Consultant shall summarize the current and future ITS needs of the regional transportation network from an operational, network and institutional perspective.

4.2.2 Task 2.2 - Develop a Vision for the Provincial / Territorial / Regional ITS Strategic Plan

By identifying problems as well as prioritized needs of the transportation network, the Consultant shall establish a set of goals and measurable objectives for the Provincial / Territorial / Regional ITS Strategic Plan that complement the ITS goals and objectives set out in Canada's ITS Plan. Based on these goals and objectives, the Consultant shall then define a clear and concise vision that will help to shape the Provincial / Territorial / Regional ITS Strategic Plan through consensus building. The Consultant shall ensure that the vision is integral to the transportation plan for the Province / Territory / Region. While the vision serves as an important benchmark for the remainder of the planning process, the Consultant shall use it as an aid in attracting additional members of the coalition. By demonstrating how ITS is envisioned to work within the regional transportation system, stakeholders will be able to see how their activities may be affected by ITS.

4.2.3 Task 2.3 - Identify User Services

Based on the vision for the Provincial / Territorial / Regional ITS Strategic Plan, the Consultant shall review the specific needs of the Province / Territory / Region, in relation but not be limited to the master list of the 35 Canadian ITS User Services presented in Appendix B, to determine those which are most applicable. The Consultant shall clearly identify and map all applicable user services against each identified need, goal and objective. Based on the level to which each user service will help in achieving each goal, the Consultant shall prioritize the user services for short (1-3 years), medium (4-7 years) and long term (up to 10 years) implementation within the Province / Territory / Region. Potential user services for future application and investment beyond the 10-year horizon shall also be indicated. Notwithstanding the user service relationships to the regional ITS and transportation goals, the Consultant shall consider the practical viewpoint (i.e., cost, technology, risk, etc.) in meeting the needs and priorities of the private sector and the travelling public in the prioritization of the user services.

The Consultant shall emphasize an “early winners” concept for addressing the short term needs and demonstrating the early benefits of ITS deployment.

As part of the environmental scan, the Consultant shall identify similar regions and examine the effectiveness of their ITS initiatives in relation to the applicable user services. The Consultant shall provide tangible examples of how the ITS user services may be of use to address the problems within the Province / Territory / Region as an early reality check in the planning process.

4.2.4 Task 2.4 - Establish Performance Criteria

The Consultant shall establish performance criteria for each of the applicable user services. The Consultant shall identify both quantitative and qualitative criteria to objectively evaluate the effectiveness of individual user services. Specific quantitative criteria will depend on the particular user service and shall be based on air quality considerations, reduction of accidents, reduction in average incident duration, percent of system users, reduction of congestion, life cycle costs, changes in travel time, stops, fuel consumption, pollutants and other standard measures of effectiveness. Qualitative criteria shall include institutional considerations, risk evaluation, user attitudes, development cycle of key components of the system, contribution to economic development (job creation, export and investment opportunities generated) and improvements to the quality of life.

4.2.5 Step 2 Deliverable - Needs Assessment / User Service Plan

The Consultant shall submit the Needs Assessment / User Service Plan summarizing the tasks conducted under Step 2. The Plan shall document the development of the prioritized needs as well as the applicable user services and their respective performance criteria for the Provincial / Territorial / Regional ITS Strategic Plan. The Consultant shall also refine the list of stakeholders and outreach program developed under Step 1 based on the needs and user services identified for ongoing coalition building.

4.3 Step 3 - Opportunities Analysis

4.3.1 Task 3.1 - Develop Operations Plan

The Consultant shall develop an operations plan for the Provincial / Territorial / Regional ITS Strategic Plan and the related user services identified. The purpose of this task is to review the user services and their relative priorities from an operational perspective to determine how the ITS Strategic Plan is to be deployed, operated and maintained in the short, medium and long terms within the constraints of the Province / Territory / Region's jurisdictions and related boundaries. The operations plan shall include recommendations on the mechanism necessary to operate the services as well as the required institutional arrangement and the respective roles and responsibilities of each agency involved. This operations plan will serve as a primary input in defining the logical and physical architectures and related information flows that are outside the scope of this assignment.

4.3.2 Task 3.2 - Conduct Institutional Analysis

Based on the operations plan developed under Task 3.1, the Consultant shall identify potential institutional barriers to the ITS Plan and related user services. The Consultant shall incorporate these barriers and associated issues in discussions with the stakeholders and recommend an action plan on how to address these concerns. This task may require the Consultant to revise the list of stakeholders developed under Step 1 and refined under Step 2.

4.3.3 Task 3.3 - Identify Opportunities

As no ITS project can become a reality without adequate funding, the Consultant shall address funding issues identifying potential funding options / sources and discussing availability of funds. In addition, the Consultant shall conduct an assessment of the ITS market. Based on the current level of investments in specific market areas, the Consultant shall examine partnership opportunities in establishing public / public partnerships to tailor advancement of technologies and public / private partnerships to permit innovative joint arrangements for ITS deployment.

4.3.4 Task 3.4 - Refine User Service Plan

Based on the above analyses, the Consultant shall refine the User Service Plan and related priorities developed under Step 2.

4.3.5 Step 3 Deliverable - Opportunities Report

The Consultant shall submit the Opportunities Report summarizing the tasks conducted under Step 3. The Report shall serve as the basis for further planning and design of ITS deployment as well as guiding investment decisions on ITS activities.

4.4 Step 4 - Define ITS Program

4.4.1 Task 4.1 - Identify Functional Requirements

For every user service, there is a set of ITS functional areas categorizing the functions of available ITS technologies. The seven basic functions include:

- Surveillance - collection of speed, volume, densities, travel time, queue length, position, classification, weather, hazardous material (etc.) and regulatory information;
- Data Processing - management integration and quality control of all data and algorithms pertaining to ITS;
- Control Strategies - strategies implemented by systems to help regulate traffic flow and ensure traveller safety;
- Traveller Interface - means by which a user interacts with information devices;
- Navigation / Guidance - systems to assist travellers in route planning, position identification and route following;
- In-Vehicle Sensors - monitoring of vehicles, driver and external driving environment that pertains to vehicle operations; and
- Communications - transmission of voice, data and video information among vehicles and system infrastructure.

For each user service identified under the User Service Plan, the Consultant shall develop the functional requirements for the provision of the services.

4.4.2 Task 4.2 - Identify Enabling Technologies

Within each functional area, there is a set of ITS components and for each component, there are various technologies that can be used to deliver the functionality required. The Consultant shall identify the various ITS components associated with each of the functional areas and those that are common to each of the functional areas identified. The components shall then be extended to identify potential ITS technologies, taking into account the rapid development of technology and the need to base future candidate technologies on evolving technologies for the medium term and trends in technology for the long term. The Consultant shall focus on identifying enabling technologies that are common to several user services and compatible from a systems perspective.

4.4.3 Task 4.3 - Identify Sub-Services

From the combinations of functional areas, ITS components and technologies, the Consultant shall define sub-services (known as market packages in the United States) providing the framework to meeting the functional requirements. An open architecture will be essential to allow specific components to be supplied by different manufacturers, facilitate opportunities for integration, and maintain sufficient flexibility for future upgrades and system expansion. However, the development of a regional architecture is beyond the scope of this assignment. The Consultant shall examine issues of deployment, institutional framework and multi-agency interaction. Sub-services under the Canadian Architecture for ITS are presented in Appendix B.

A sub-service is a combination of hardware, software and services that become a building block used in the implementation of a set of the related functional requirements.

4.4.4 Step 4 Deliverable - Framework of ITS Program

The Consultant shall submit the Framework of the ITS Program summarizing the tasks conducted under Step 4. The Framework shall provide the high level statement of sub-services as input to the subsequent architecture definition which is outside the scope of this planning process.

4.5 Step 5 - Define Deployment Program

4.5.1 Task 5.1 - Identify Strategic Projects

Based on the sub-services established under Task 4.3, the Consultant shall identify strategic projects for deployment by the various sponsoring agencies in the short, medium and long terms. In consideration of the available funding levels, deployment of ITS projects may need to be modular and as needs develop. Initial deployment of smaller scale, yet complete system of useful, usable components will provide a testbed from which life cycle costs, including operations and maintenance costs, as well as benefits to both transportation users and providers can be identified and assessed. As needs arise and additional funding becomes available, the initial system will be expanded both geographically and functionally in a modular fashion. Alternatively, some projects may be field operational tests designed to test ITS technologies. The Consultant shall ensure that deployment of ITS builds upon the existing systems infrastructure that is already, or soon to be, in place. The Consultant shall identify "early winner" projects where appropriate to address immediate needs of the various sponsoring agencies and demonstrate the early benefits of the ITS deployment.

4.5.2 Task 5.2 - Develop Deployment Plan

The Consultant shall develop the Deployment Plan to guide the implementation of ITS strategic projects commensurate with the needs and objectives identified in the User Service Plan for the various sponsoring agencies. The Deployment Plan shall identify projects for short, medium and long term implementation, and respective roles of the sponsoring agency. The Consultant shall include order-of-magnitude cost estimates including capital costs, operation and maintenance costs and staff costs for projects under short and medium term implementation as well as the benefits of the ITS Program based on experiences from other jurisdictions.

Based on the Opportunities Report developed under Step 3, the Consultant shall include in the Deployment Plan an action plan in pursuit of partnerships and to address multi- as well as inter-agency issues. The Consultant shall ensure that the Deployment Plan provides flexibility to allow for integration of new technologies as they are developed and tested, and for alternative implementation schemes based on various levels of funding and differing partnership alternatives.

4.5.3 Task 5.3 - Develop Action Plan for Ongoing Evaluation

The Deployment Plan is not an end unto itself. Upon completion, there is a continuing need to carry out the myriad activities described in the Plan. The Plan functions as a living document that requires refinement and update over time. The Consultant shall develop an Action Plan for ongoing monitoring through implementation and subsequent performance evaluation. The Action Plan shall identify priorities, critical activities (including the early development of a regional architecture based on the national framework) and funding decision points. Based on the performance criteria developed under Task 2.4, the Consultant shall establish project specific performance criteria to facilitate evaluation following project implementation.

4.5.4 Task 5.4 - Final Report

Under this task, the Consultant shall bring the strategic planning to a close with a clear and concise final report which summarizes all the findings and recommendations.

4.5.5 Step 5 Deliverable - Final Report

The Consultant shall submit the Final Report summarizing the tasks conducted under Step 5. The Final Report shall provide a summary of the entire project as well as document the Deployment Plan to guide the implementation of ITS strategic projects for the various sponsoring agencies and the Action Plan for ongoing evaluation.

5. REPORTING STRUCTURE

The development of the strategic plan will be managed by *[INSERT NAME AND TITLE OF PROJECT MANAGER]*, who will report directly to the Steering Committee comprising of the following members:

[INSERT NAMES AND TITLES OF MEMBERS OF THE STEERING COMMITTEE]

6. MILESTONES AND SCHEDULE

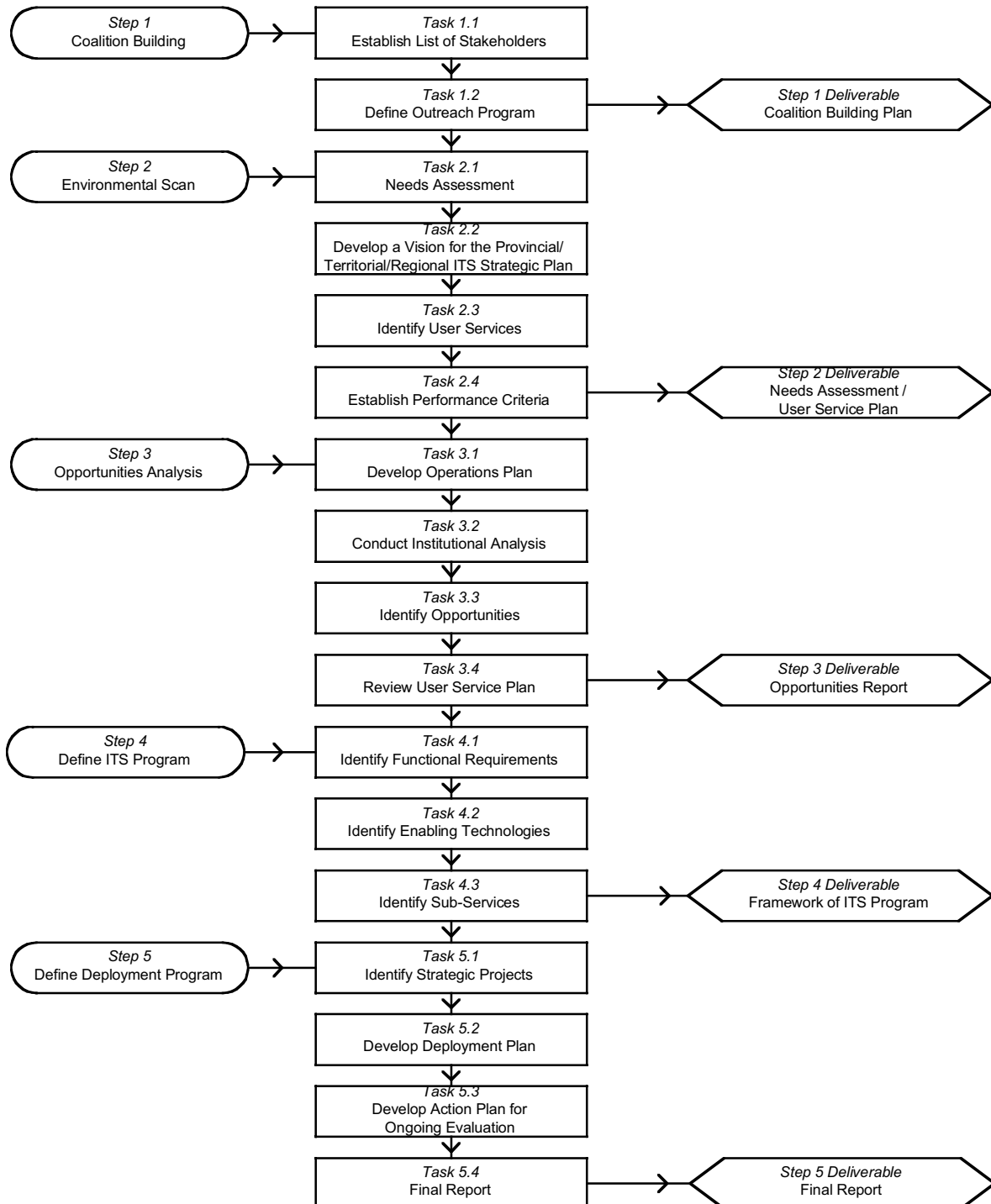
The overall duration of the assignment will be *[INSERT DURATION]* months *[range from 6-9 months for smaller jurisdictions, and up to 12-15 months for larger Provinces / Territories / Regions]*.

The Consultant shall develop a Project Schedule specifying key dates for activities to be carried out and milestone dates for the submission of project deliverables.

The Consultant shall submit sufficient copies of the draft deliverables one week prior to the due dates to the Steering Committee for review and comment. Electronic copy and one reproducible master of the final deliverables incorporating comments from the Steering Committee are to be submitted by the due dates.

APPENDIX A

PLANNING PROCESS



APPENDIX B

ITS DEVELOPMENT AREAS, USER SERVICES & SUB-SERVICES FOR CANADA

Development Area		User Service		Sub-Service			
1.	Traveller Information Services	1.	Traveller Information	1.	Broadcast Traveller Information		
				2.	Interactive Traveller Information		
				3.	Real-Time Ridesharing Information		
		2.	Route Guidance and Navigation	3.	Ride Matching and Reservation	4.	Autonomous Route Guidance
						5.	Dynamic Route Guidance
						6.	ISP-Based Route Guidance
						7.	Traffic Estimation and Prediction
						8.	In-Vehicle Signing
		4.	Traveller Services and Reservations	3.	Traveller Services and Reservations	9.	Ride Matching
						10.	Real-Time Ride Matching
						11.	Traveller Yellow Pages
						12.	Services Purchases and Reservations
						13.	Parking Facility Management
						14.	Regional Parking Management
2.	Traffic Management Services	5.	Traffic Control	15.	Traffic Network Flow Monitoring		
				16.	Surface Street Control		
				17.	Highway Control		
				18.	Regional Traffic Control		
				19.	Traffic Information Dissemination		
				20.	Virtual TMC		
				21.	Probe-Based Flow Monitoring		
				22.	Traffic Estimation and Prediction		
				23.	Incident Management Coordination		
				24.	Incident Prediction System		
				6.	Incident Management	7.	Travel Demand Management
		26.	Reversible Lane Management				
		27.	Predictive Demand Management				
		8.	Environmental Conditions Monitoring	8.	Environmental Conditions Monitoring	28.	Roadway Environmental Sensing
						29.	Emissions Management
						30.	Road Weather Information System
						31.	Vehicle-Based Sensing
		9.	Operations and Maintenance	9.	Operations and Maintenance	32.	Infrastructure Maintenance Management
						33.	Smart Work Zones
		10.	Automated Dynamic Warning and Enforcement	10.	Automated Dynamic Warning and Enforcement	34.	Dynamic Roadway Warning
						35.	Variable Speed Limit and Enforcement
						36.	Signal Enforcement
		11.	Non-Vehicular Road User Safety	11.	Non-Vehicular Road User Safety	37.	Mixed Use Warning Systems
						38.	Automated Non-Vehicular Road User Protection
		12.	Multi-Modal Junction Safety and Control	12.	Multi-Modal Junction Safety and Control	39.	Basic At-Grade Crossing Control
						40.	Advanced At-Grade Crossing
						41.	Modal Operations Coordination
						42.	Transit Vehicle Tracking
43.	Transit Fixed-Route Operations						
3.	Public Transport Services	13.	Public Transport Management	44.	Passenger and Fare Management		
				45.	Transit Maintenance		
				46.	Multi-Modal Coordination		
				47.	Multi-Modal Connection Protection		

Development Area		User Service		Sub-Service	
3.	Public Transport Services (Cont'd)	14.	En-Route Transit Information	48.	En-Route Transit Information
		15.	Demand Responsive Transit	49.	Demand Responsive Transit
		16.	Public Travel Security	50.	Public Travel Security
4.	Electronic Payment Services	17.	Electronic Payment Services	51.	Electronic Toll Collection
				52.	Electronic Parking Payment
				53.	Transit Services Payment
				54.	Traveller Services Payment
5.	Commercial Vehicle Operations	18.	Commercial Vehicle Electronic Clearance	55.	Electronic Clearance
				56.	International Border Crossing Clearance
				57.	Weigh-In-Motion (WIM)
		19.	Automated Roadside Safety Inspection	58.	Inspection Support Systems
				59.	Automated Vehicle Safety Read Out
		20.	On-Board Safety Monitoring	60.	On-Board Safety Monitoring
		21.	Commercial Vehicle Administrative Processes	61.	Commercial Vehicle Administrative Processes
		22.	Inter-Modal Freight Management	62.	Freight In-Transit Monitoring
				63.	Freight Terminal Management
		23.	Commercial Fleet Management	64.	Fleet Administration
65.	Freight Administration				
66.	CVO Fleet Maintenance				
6.	Emergency Management Services	24.	Emergency Notification and Personal Security	67.	Personal Security
				68.	MAYDAY Support
		25.	Hazardous Material Planning and Incident Response	69.	Hazardous Material Planning and Incident Response
		26.	Disaster Response and Management	70.	Disaster Command and Control
				71.	Disaster Information Dissemination
27.	Emergency Vehicle Management	72.	Emergency Response Management		
		73.	Emergency Vehicle Routing		
7.	Vehicle Safety and Control Systems	28.	Vehicle-Based Collision Avoidance	74.	Lateral Warning Systems
				75.	Lateral Crash Avoidance
				76.	Longitudinal Warning Systems
				77.	Longitudinal Crash Avoidance
		29.	Infrastructure-Based Collision Avoidance	78.	Intersection Collision Warning
				79.	Intersection Collision Avoidance
		30.	Sensor-Based Driving Safety Enhancement	80.	Sensor-Based Driving Safety Enhancement
		31.	Safety Readiness	81.	Vehicle Safety Monitoring
				82.	Driver Safety Monitoring
		32.	Pre-Crash Restraint Deployment	83.	Pre-Crash Restraint Deployment
33.	Automated Vehicle Operation	84.	Automated Vehicle Operation		
8.	Information Warehousing Services	34.	Weather and Environmental Data Management	85.	Roadway and Weather Data Fusion
				86.	Environmental Information Dissemination
				87.	Roadway Meso and Micro Prediction
		35.	Archived Data Management	88.	Archived Data Mart
				89.	Archived Data Warehouse
90.	Archived Data Virtual Warehouse				

APPENDIX C

CANADIAN ARCHITECTURE SUBSYSTEMS INTERCONNECT DIAGRAM

The Canadian Architecture for ITS

